

Unit #	Global Climate Change: Middle School	Estimated Duration
1		18
Unit Rationale	Global climate change and its impacts on people and resources pose serious societal challenges. The actions we take today will influence the path of future greenhouse gas emissions and the magnitude of warming; they will also affect our ability to respond and adapt to changes, and to reduce vulnerability of people and places to possible harm. Educating future generations about the causes and effects of global climate change is imperative since implementing solutions depends on an informed public.	
Unit Goals	<ol style="list-style-type: none"> 1. Students will be able to explain the elements of climate and analyze the earth's energy balance that affects climate change. 2. Students will be able to identify various sources of evidence used to chart climate and apply the evidence to determine the proximate and ultimate causes. 3. Students will be able to analyze the impact of climate change on environmental, biological and social systems. 4. Students will be able to compare climate change mitigation and adaptations strategies (macro and micro) in light of environmental, economic, political, and ethical impact. 5. Students will use data and evidence to justify claims relating to climate, climate change, and mitigation. 	
Prior Knowledge	Students will be familiar with different aspects of weather and climate, but may not be able to differentiate the two terms. Students will also have heard the terms climate change and global warming, but may not understand the science behind these terms. Students will likely confuse other environmental issues like acid rain and holes in the ozone layer with climate change.	
Summative Unit Assessment(s)	<ol style="list-style-type: none"> 1. Concept Map 2. Mitigation Wedges Performance Assessment 3. Traditional Test 	

Lesson #	estimated # of days	Lesson Objective Lesson Assessment	Standards
LP1	2	Objective: Students will be able to identify the relevance of studying climate change and differentiate between elements of weather and climate.	E6.a, E6.b
		Assessment: Concept Map, Graphin It Up activity, Content Pre-Assessment	
LP2	2	Objective: Students will be able to apply the concepts of energy and light to create an input/output model of energy budget for the Earth. Students will be able to use scientific language to explain the path sunlight travels.	
		Assessment: Concept Map, Energy Budget Posters, Lab Write-Up, Quiz	
LP3	3	Objective: Students will be able to identify greenhouse gases and their sources. Students will explain the role these gases play in the Earths' energy budget.	
		Assessment: Gas Files Activity, Quiz	
LP4	4	Objective: Students will analyze the sources for climate data and will analyze this data to identify the impact of climate change on physical and biological systems. Students will identify, compare, and contrast adaptation and mitigation strategies.	E1.c, E4.a, E4.b, E4.c, E6.a, E6.c, E8.b, I1.a, I1.d
		Assessment: Quiz over using data to make conclusions & mitigation strategies, Great Discussion, Concept Map	
LP5	2	Objective: Students will be able to identify elements of scientific consensus making and analyze debates about the validity of global warming claims.	I1.1, I1.m
		Assessment:	
LP6	4	Objective: Students will be able to compare and contrast climate change mitigation strategies (macro and micro) in light of environmental, economic, political, and ethical impact	
		Assessment: Mitigation Wedges Performance Assessment: Group & Individual Products	
LP7	1	Objective: Traditional Test	
		Assessment: Traditional Test	

LP 1

Introduction to Climate Change

# of Days	2		
Prior Knowledge	Students will likely know about different weather phenomena, but may confuse weather and climate.		
Lesson Objective	Students will be able to identify the relevance of studying climate change and differentiate between elements of weather and climate. Students will be able to identify main parts of a graph. Students will be demonstrated understanding of evidence and claims.	Language Goals/Demands	Students will be able use different terms to relate components of the climate system and weather to each other. Demands: Definitions - Students must be able to recognize keywords that identify definitions; Concept Map - Students must know the difference between and be able to use nouns and verbs. Standards: Reading 2.3, 2.4, 2.5, 2.8 (Article Analysis) Listening & Speaking 1.2 (Article Analysis) Writing 2.3.c (Concept Map)
Lesson Assessment	Concept Map, Graphin' It Up activity	Changes for Next Time	
(Benchmarks or Standards)	E6.a, E6.b		
Materials Needed	Student handouts, powerpoint slides, computer, projector, internet connection	What Worked Well	
Time	Learning Task or Activity	Method & Notes	
Day 1			
30 min	<p>Lesson Hook</p> <ul style="list-style-type: none"> - Tell students that they are about to start a three week unit on climate change. - Climate change is a big issue in the news, but why is it such a big deal? - You will read a one-page article about the impact of climate change. (The article is adapted from an article about sea level rise on small Pacific island nations) - Students will read in small groups and then discuss the article using the provided questions. - Make sure you have students think about whether this will impact them or not. - Watch video on Tuvalu 	<p>SMALL GROUPS</p> <p>See 1.1.1 for Article</p> <p>See 1.1.2 for Activity</p> <p>See Slide 1.1.3 for Article Vocabulary</p> <p>http://www.youtube.com/watch?v=BNqI8BiAijw&feature=related (video on Tuvalu)</p>	

8 min	<p>Sea Level Impact in the Bay Area</p> <ul style="list-style-type: none"> - Here is a map of the sea level rise that could take place here in the Bay Area. (Show Google Map Image of Sea Level Rise) - Show students the current sea level and then have them make predictions about how much rise it will take to flood certain areas close to their school 	<p>WEB DEMO</p> <p>Google Maps Sea Level Rise http://flood.firetree.net/?ll=43.3251,-101.6015&z=13&m=7 (Find the North America Map and Zoom in on your coastal area. Start with 0 meters sea level rise so that students have a baseline and then increase in increments of your choice).</p>
15 min	<p>Defining Weather and the Climate System</p> <ul style="list-style-type: none"> - Tell students that over the next three weeks you will learn more about how climate is changing and the impacts of this change. - But first, we have to make sure we understand exactly what weather and climate are. 	<p>LECTURE/POWERPOINT</p> <p>See Slides 1.1.4</p>
10 min	<p>Weather or Climate Activity</p> <ul style="list-style-type: none"> - Teacher will have students identify whether the phenomenon are weather or climate - Write each on the board OR teacher may put up posters with phenomenon listed. Students write "weather" or "climate" for each. 	<p>See 1.1.5 Weather or Climate Activity</p>
HW	<p>HW sheet 1.1.6.</p>	<p>HOMEWORK</p>
Day 2		
5 min	<p>BW: in journals: define climate, define weather. Which layer of the atmosphere is where weather occurs?</p>	<p>INDIVIDUAL SEAT WORK</p> <p>Hand out 1.2.1 Reading on Atmosphere- read and discuss as group</p>
10 min	<p>Consequences of Global Warming (or Climate change) is extreme weather and weather events (wildfires, floods)</p>	<p>Activity 1.2.0 - have students share skits and discuss</p>
15 min	<p>Evidence and Claims</p> <ul style="list-style-type: none"> - Explain that one way of "doing science" is to make claims and find/use evidence (proof). Review definition then show videos and have students complete the worksheet. 	<p>VIDEO PRESENTATION</p> <p>Use 1.2.2 Claims and Evidence</p> <p>tornado: http://www.youtube.com/watch?v=oJlfAGC8G8w&feature=relmfu drought: http://www.youtube.com/watch?v=u9s_A0G7oUU&feature=related rainstorm: http://www.youtube.com/watch?v=ugK4AsMEVsg blizzard: http://www.youtube.com/watch?v=gqi0K1CaWXI&feature=related wildfire: http://www.youtube.com/watch?v=yujOhGio_BE</p>
10 min	<p>Graphing and Data</p> <ul style="list-style-type: none"> - Students discuss the answers to the questions on their worksheet while examining the projected graph. 	<p>GROUP DISCUSSION AND STUDENT WORK</p> <p>Use 1.2.3 Whole Class Graph</p> <p>Use 1.2.4 Student Worksheet Graph Reading</p>

15 min	<p>Concept Map Introduction</p> <ul style="list-style-type: none"> - Handout Concept Map Instructions - Explain that students will be making a concept map throughout the unit. - Make sure students write in pencil 	<p>LECTURE</p> <p>See 1.2.5 Concept Map Instructions</p>
10 min	<p>Graphin It Up!</p> <ul style="list-style-type: none"> - Students individually complete worksheet to learn skills on how to read graphs which essential in later lessons. 	<p>INDIVIDUAL WORK</p> <p>Use 1.2.6 Graphin It Up!</p>
HW	<p>Pass out Homework</p> <p>Questions and Reading on personal connection to climate change</p>	<p>HOMEWORK:</p> <p>Use 1.2.7 Questions</p> <p>Use 1.2.8 Reading</p>

LP 2

Energy Budget

# of Days	2		
Prior Knowledge	Students will have conceptions about the orientation of the Earth to the Sun. They will know that the Earth has a tilt. Many will probably think that the seasons are due to the distance from the sun. Finally, students will have a basic understanding that the Sun provides both light and heat for the Earth.		
Lesson Objective	Students will be able to use scientific language to explain the path sunlight travels. Students will be able to apply the concepts of energy and light to create an input/output model of energy budget for the earth.	Language Goals/Demands	Students will be able to: - use technical terms and notations accurately (Writing 2.3f) (homework) - formulate judgment about ideas under discussion and support those judgments with convincing evidence (Listening and Speaking 1.1) (Discussions during activities and demonstration)
Lesson Assessment		Changes for Next Time	
(Benchmarks or Standards)	Physics 3.a, 3.b, 4.a, 4.e, 7.a; Earth Science 4.b, 4.c, 4.d, 6.a, 8.a: Investigation 1.d, 1.g		
Materials Needed	Styrofoam balls and lights for Sun-Earth Model Activity Rope for wavelength demonstration, Bottles, buckets, etc for Dynamic Balance Activity	What Worked Well	
Time	Learning Task or Activity	Method & Notes	
Day 1			
3 min	BW: Why does someone in Brazil experience different climate than you do in the Bay Area?	INDIVIDUAL SEAT WORK OR PAIR WORK	
4 min	Discuss BW	See 2.1.1 Bell Work Teacher Guide for answers and explanations	
4 min	Energy Budget Introduction - Discuss the terms energy, budget, and equilibrium.	LECTURE/PRESENTATION See 2.0.1 Definitions See 2.1.3 Energy Budget Slides #2-5 Use 2.1.4 Action Notes	

7 min	<p>Sun-Earth Model Activity Introduction</p> <ul style="list-style-type: none"> - Where does the Earth get its energy? - How much energy reaches the Earth? <p>Give students directions about the activity. Since they know the Sun is responsible for the Earth's energy, how do we know how much energy reaches the Earth from the Sun?</p>	<p>Q&A/ACTIVITY INSTRUCTIONS</p> <p>See 2.1.2 Sun-Earth Modeling Activity</p> <p>This activity could be shown as a whole class demonstration or in small groups. Pass out student task sheet to each student.</p>
12 min	<p>Sun-Earth Model Activity</p> <ul style="list-style-type: none"> - Student pairs use a light source and styrofoam balls to model the energy input from the Sun. 	<p>PAIR WORK/HANDS-ON ACTIVITY or CLASS DEMONSTRATION using student task sheet</p>
5 min	<p>Sun-Earth Model Activity Debrief</p> <ul style="list-style-type: none"> - Teacher asks students for ideas about quantifying the solar output. - Discuss variables that are important: Size of planets, distance from each other, tilt of the planets - Discuss the impact of changing each of these variables of the input 	<p>DISCUSSION</p> <p>See 2.1.2 for Debrief Question Prompts</p>
17 min	<p>Develop the conceptual Energy Budget Model</p> <ul style="list-style-type: none"> - Step through the incoming energy and the reflected energy - What are reasons why all of the Sun's energy is not warming the Earth? Talk about reflective surfaces and albedo. - Wavelength Demonstration - Optional albedo research video and additional slides 	<p>LECTURE/PRESENTATION</p> <p>See 2.1.3 Energy Budget Slides #6-17</p> <p>Students complete 2.1.4 Action Notes</p> <p>One 5' long rope or shorter ropes for group work</p> <p><i>Optional video -</i> <i>http://www.youtube.com/watch?v=9UJKVa2CICU&feature=related</i></p>
5 min	<p>Concept Map Additions:</p> <p>Sun, Earth, Energy Budget, Albedo</p> <ul style="list-style-type: none"> - Have students work in pairs to discuss how to add the additional words to their concept maps 	<p>INDIVIDUAL SEAT WORK OR PAIR WORK</p> <p>See 2.1.3 Energy Budget Slides #20</p>
HW	<p>Conceptual Understanding of Energy Budget</p> <ul style="list-style-type: none"> - Add new terms to concept map and write a "story of energy" to share with class 	<p>Use concept map to compose a 5-7 sentence story (explanation) of the path of sunlight.</p>

Day 2		
3 min	BW: We know that if the Sun kept inputting energy and it didn't go anywhere, then we would eventually be fried. What do you think happens to this energy? Why don't we all burn up?	INDIVIDUAL SEAT WORK See 2.2.1 Energy Budget Slides #2
20 min	<i>Albedo Activity</i> Students use their understanding of color and albedo to predict the albedo of surfaces that they see.	<i>OPTIONAL: INDIVIDUAL WORK</i> 2.2.X Albedo Activity, outside if desired.
4 min	Review energy budget and variables - Students complete review either alone or with partner.	DISCUSSION/PRESENTATION Use 2.2.0 Review
20 min	Energy Output Model - Building understanding of outgoing radiation - Temperature – What did you observe? - Sun and Earth outgoing wavelengths - Atmosphere and Greenhouse gases	DISCUSSION/PRESENTATION See 2.2.1 Energy Budget Slides See 2.2.2 Student Action Notes Need rope for wave length demonstration (if possible have students experiment with ropes, moving them more and less vigorously)
25 min	Dynamic Energy Balance - This can be an activity or demonstration. - This provides direct experience of how changes to a system can alter the existing dynamic balance. - Refer to Bell Work. Talk about losing energy and ask for examples of analogies of this.	ACTIVITY/DEMONSTRATION See 2.2.3 for Dynamic Balance Activity
3 min	Concept Map Additions: Longwave radiation, shortwave radiation	INDIVIDUAL WORK See 2.2.1 Energy Budget Slides #19
HW	Complete Energy Budget Review sheet	HOMEWORK 2.2.4 homework problems

LP 3

Greenhouse Gases

# of Days	3		
Prior Knowledge	Students will have heard of greenhouse gases. They probably will know very little about energy balance.		
Lesson Objective	Students will be able to identify greenhouse gases and their sources. Students will explain the role these gases play in the Earth's energy budget.	Language Goals/Demands	Reading 2.5 Listening 1.1 Speaking 2.2 b and c
Lesson Assessment (Benchmarks or Standards)	Concept map on days 2-3, formative - connection of sources and sinks, Lab activity Earth Science 4c and 4d, Investigation 1 a, b, c, d, and k	Changes for Next Time	
Materials Needed	Powerpoint, Materials for greenhouse gas effect activity; Resonance models with tennis balls, etc.; Gas Files Activity	What Worked Well	
Time	Learning Task or Activity	Method & Notes	
Day 1			
3 min	BW: Study for the Quiz over LP 1 & 2 Share/review last night's homework	INDIVIDUAL SEAT WORK	
15 min	Quiz	INDIVIDUAL SEAT WORK 3.1.2 QUIZ	
7 minutes	What do you already know? What are the greenhouse gases? Where do they come from? How do they work?	KWL Chart See 3.1.3 Greenhouse Gases Slide #2 Activating prior knowledge. Before naming the greenhouse gases, ask what students already know.	
10 minutes	Greenhouse Gas Presentation - If the amount of energy that comes in is the same amount of energy that goes out, how can our planet stay warm? - The answer is greenhouse gases.	LECTURE/DISCUSSION See 3.1.3 Greenhouse Gases Slides #3-5 Use 3.1.4 Student Notes Handout	

20 min	Resonance Model Demonstration - Show students different models of atmospheric compounds and how they resonate. Have students connect the different wavelengths with resonance. What would happen without greenhouse gases? Goldilocks slide.	LECTURE/DEMONSTRATION See 3.1.3 Greenhouse Gases Slides #6-10 DEMONSTRATION - Follow 3.1.5a Task Card. Collect data by group on the board. Use 3.1.5 for instructions to make models. VIDEO: Resonance by Scott Denning http://www.youtube.com/watch?v=AIBk0pGV_BQ&feature=related
HW	Students are to read the Carbon Dioxide and Greenhouse Effect and create 5 questions and an answer key.	HOMEWORK 3.1.6 Reading on Carbon Dioxide and the Greenhouse Effect
Day 2		
3 min	BW: What would happen if there were no greenhouse gases?	INDIVIDUAL SEAT WORK
35 min	The Greenhouse Gas Effect Activity and Poster -Students should work in groups to set up their labs. If they are successful at trapping CO ₂ they should see a change in temperature in about 20 minutes. - While waiting/collecting data, students create a Greenhouse Effect Posters. Students work individually or with partners to create a poster to illustrate the path of sunlight as it radiates to the Earth (include pictures of Sun, Earth and representation of the terms radiation, reflection, absorption, and greenhouse gases).	HANDS-ON LAB 3.2.1 Greenhouse Gas Lab – written directions Greenhouse Effect Poster supplies
7 min	Debrief Lab and Discussion Debrief the lab, discuss the greenhouse effect and how the gas in the atmosphere does cause an increase in temperature.	DISCUSSION/LECTURE/Q&A See 3.1.3 Greenhouse Gases Slides #10-11
5 min	Energy Balance Diagram or Review of Resonance - Teachers and students will step through the different parts of the energy balance diagrams with students providing explanations for each of the arrows. - Students continue working on posters.	DISCUSSION/LECTURE/Q&A See 3.1.3 Greenhouse Gases Slides #12 or 13 Students continue working on the posters and share with classmates
5 min	Concept Map - Students will add to the concept map. Hand out the new words they should add to their maps.	INDIVIDUAL SEAT WORK Use 3.2.2 Concept Map Homework
HW	Work on concept map	

Day 3		
3 min	BW: What do you think are the sources of greenhouse gases? - Check concept maps	INDIVIDUAL SEAT WORK
7 min	Introduction to today's activity: Sources and Sinks - Thought question about bathtub.	THINK/PAIR/SHARE Use 3.3.1 Bathtub Thoughts Handout
25 min	Gas Files Activity - Students look at data and graphs to determine the quantities and sources of the different greenhouse gases - Examples will deal with CO ₂ , methane, nitrous oxide, and water vapor	GROUP WORK Use 3.3.2 Gas Files Activity
15 min	Mitigation Strategies - Show the wedge diagram that will be used with the final assessment showing increases in greenhouse gases. - Talk about three or four wedges - ways to mitigate more carbon emissions	LECTURE/NOTES 3.3.3 Mitigation Strategies Slides Use 3.3.3A for student notes during the presentation 3.3.5 <i>Pictures of Power Plants</i> OPTIONAL
HW	Concept Map - Students will add to the concept map. Hand out the new words they should add to their maps.	HOMEWORK 3.3.4 Concept Map Homework

LP 4

Impact, Adaptation, and Mitigation of Climate Change

# of Days	4		
Prior Knowledge	Depending on students' backgrounds they may or may not be able to identify dependent and independent variables. If students struggle with reading easy graphs, they may need more scaffolding prior to the Stations activity.		
Lesson Objective	Students will analyze the sources for climate data and will analyze this data to identify the impact of climate change on physical and biological systems. Students will identify, compare, and contrast adaptation and mitigation strategies.	Language Goals/Demands	Students will be able to describe the impacts of climate change on the physical system and justify claims with evidence. ELA standards: Reading 2.5; Writing 2.3.b, c; Speaking 1.1, 2.0.b, c
Lesson Assessment	Quiz over using data to make conclusions & mitigation strategies	Changes for Next Time	
(Benchmarks or Standards)			
Materials Needed	Graphs and Questions for each station; Graphs for Causes; Powerpoint slides for Ice Core Explanations, Mitigation Powerpoint	What Worked Well	
Time	Learning Task or Activity	Method & Notes	
Day 1			
5 min	BW: Some scientists collect data from tens of thousands of years ago. How do you think scientists can know what happened so far in the past? Discuss your ideas with a partner.	PAIR WORK	
20 min	Data Collection Instrumentation - Show students slide #2 pointing out that the data goes back 100,000 years. - Ask for student input about how data is collected especially from periods long ago. (Talk about thermometers, satellites, etc. and introduce ice cores if students don't suggest this) - Pass out Guiding Questions for use.	WHOLE CLASS DISCUSSION/ANALYSIS See Slides 4.1.1 for Ice Core Slides (How do We Know) See 4.1.1 for Ice Core Slides and Notes See 4.1.2 for Ice Core Guiding Questions If you have access to streaming video, you may replace the slide show and data analysis with the KQED video (20 minutes) on ice cores found at: http://www.kqed.org/quest/television/web-extra-at-the-core-of-climate-change	
20 min	Assessment on Claims and Evidence - Work on claim #1 as a whole class. - Work claim #2 individually.	WHOLE CLASS/INDIVIDUAL WORK 4.1.3 Assessment on Claims and Evidence	
HW	Concept Maps - Add the following terms and relationships to your map: ice core, evidence, claim		

Day 2		
5 mins	BW: Define Anthropogenic. Give 2-3 examples.	INDIVIDUAL WORK/ SHARE OUT WITH WHOLE GROUP
5 mins	Consequences of Climate Change: Sea Level Rise - Ask students to share different consequences for humans or the environment - End by talking about sea level rise as an important consequence for coastal areas like the Bay Area. - Also REMIND students of ALBEDO: different materials/surfaces have different level of reflectivity. Ice reflects more light than other substances. Snow reflects 95% of radiation. The water under the ice can absorb large amounts of heat energy, which could increase temp of water and cause more melting.	LECTURE/DISCUSSION See 4.2.0 Consequences Slides
10 mins	Begin Sea Level Activity - Students will set up Sea Level Activity (in small groups) and record initial observation of water level. - Teachers monitor group progress.	HANDS-ON ACTIVITY See 4.2.1 Sea Level Activity Instructions and Datasheet
15 mins	Quiz over LP 4	INDIVIDUAL SEAT WORK 4.2.2 LP4 Quiz and Key Second observation of ice after quiz.
20 mins	Sea Level Activity Continued - Have students make 2 more observations (at 20 and 30 min) -Teacher lead discussion (based on preliminary observations). What has occurred? What is different? What is the same between the two conditions? What are the scientific principles behind this phenomena? -Students make final observations.	HANDS-ON ACTIVITY CONTINUED See 4.2.1 Ice Activity Instructions and Datasheet.doc Students Check every 10 minutes, recording results on table. Have students work with groups to discuss and answer questions. If there is time, conclude with a whole group discussion.
Day 3		
3 mins	BW: What parts of Earth's systems do you think are changing due to increased greenhouse gases? Think of two or three possibilities.	INDIVIDUAL SEAT WORK

5 mins	<p>Impact of Climate Change on Biological and Physical Systems Stations:</p> <ul style="list-style-type: none"> - Humans are responsible for significant increased carbon emissions that have an impact on physical and biological systems. Today we are going to look at evidence to make claims about the impact of increased emissions on the physical and biological worlds. You will be divided into groups and rotate through four stations. Each station has the instructions and task cards. You will record your answers on the student handout. - Divide up students into four groups 	<p>TEACHER-LED INSTRUCTIONS</p> <p>See 4.3.1 for Group Station Task Cards See 4.3.2 for Student Handout: Impact on Physical Systems See 4.3.3 for Student Handout: Impact on Biological Systems See 4.3.4 for Station Graphs for Physical Systems See 4.3.5 for Station Graphs for Biological Systems</p>
32 mins	<p>Impacts Due to Climate Change</p> <ul style="list-style-type: none"> - Students will spend approximately 4 minutes at each station and complete task and answer questions with their group members. - Physical Systems Stations 1 - 8 align with Graphs 1 - 8. 1-4 are Impacts on Physical System, 5-8 are Impacts on Biological Systems 	<p>GROUP WORK</p> <p>See 4.3.1 for Group Station Task Cards See 4.3.2 for Student Handout: Impact on Physical Systems See 4.3.3 for Student Handout: Impact on Biological Systems See 4.3.4 for Station Graphs for Physical Systems See 4.3.5 for Station Graphs for Biological Systems</p>
15 mins	<p>Group Processing/Station De-brief: Group Processing/Station Debrief</p> <ul style="list-style-type: none"> - What claims can be made about climate change? - What is the evidence that climate is changing? What is the impact on physical systems? - Remind students to support their statements with data from the previous day's stations. - Is this evidence convincing? 	<p>TEACHER-LED DISCUSSION</p> <p>Use 4.3.4 and 4.3.5 slides to remind students of the graphs</p>
HW	<p>Respond to the following questions:</p> <p>1) What do you think will be the easiest consequence to deal with? 2) Based on what we've learned so far, what are some ways that climate change might affect the community where you live?</p>	
Day 4		
5 mins	<p>BW: List one way climate change impacts: a) agriculture b) ecosystems c) weather and d) health</p>	<p>INDIVIDUAL SEAT WORK and SHARE OUT</p>

10 min	<p>Mitigation Review</p> <ul style="list-style-type: none"> - We have talked about the presence of greenhouse gases and how we detect them, how do you think we can limit them? We will be talking about this at different points over the next few lessons. - Have the chalkboard divided into four parts. Assign student pairs to one sector and have them discuss for four or five minutes how we might be able to decrease or "mitigate" greenhouse emission in these sectors. Have students write ideas on the board under the proper heading - Possible Sectors: Transportation, Heating & Cooling Buildings, Industry emissions, Electricity Use 	<p>PAIR WORK</p> <p>Use 4.4.1. Slides to review mitigation OR 4.4.2 Mitigation & Adaptation Slides</p>
10 min	<p>Introduction to idea of Adaptation</p> <ul style="list-style-type: none"> - Review Mitigation (introduced in earlier lessons). Introduce idea of adaptation. Create a KWL (what we KNOW, what we WANT to know, and what we LEARNED (this column will be filled in later) about adaptation. - We've looked at some of the impacts of climate change, one example is sea level rise. What are some things we can do to prevent more damage from climate change? The changes and adjustments we make are "adaptations". We will be getting more into mitigation with the final lesson (acting regionally or globally). 	<p>DISCUSSION</p> <p><i>OPTIONAL: Use 4.4.3 Adaptation Resource</i></p>
15 mins	<p>The Great Discussion Preparation</p> <ul style="list-style-type: none"> - Students will work in groups, pulling together the various activities, data, and information they have learned over the course of the Climate Change Unit. Describe how due to resources only ONE area of impact can be addressed. Each student will be assigned one of the four topics from the stations. Why should your topic be the one area addressed? Give examples and evidence to support your position (including feasible and practical mitigations and adaptations). 	<p>GROUP WORK</p> <p>The Great Discussion will allow students opportunity think about acting locally. Teacher will assign each group an area of impact: ecosystem, agriculture, severe weather, or health.</p>
20 mins	<p>The Great Discussion Presentations</p>	<p>STUDENT GROUP PRESENTATION</p> <p>Discussion format: teacher's choice</p>
HW	<p>Write down some things you learned about Climate Change adaptation (KWL CHART).</p>	

LP 5**Science Consensus and the Climate Change Debate**

# of Days	2		
Prior Knowledge	Students will have attained a basic level of the science behind global warming. Students will also likely have been exposed to elements of the global warming debate through various media sources.	California English-Language Arts Content Standards	Reading 2.8 Listening and Speaking 1.11, 1.12, 1.13
Lesson Objective	Students will be able to identify elements of scientific consensus making and analyze debates about the validity of global warming claims.	Language Goals/Demands	Teachers must be prepared to moderate discussions and arguments that may have deep seeded values based on political, religious, or social identities
Lesson Assessment		Changes for Next Time	
California State Science Standard	Investigation 1.I, 1.m		
Materials Needed	Video Projector, Laptop or Computer with Connection to Internet	What Worked Well	
Time	Student Learning Task or Activity	Teacher METHOD or Activity	
Day 1			
25 min	Preponderance of Evidence Activity - Students should be divided into groups. There are 8 different cards. Students will review the cards for their group, discuss the evidence, and then listen/give presentations and take notes on all the other evidence.	GROUPWORK 5.1.1 Preponderance of Evidence.ppt (to use as resource cards) 5.1.2 Preponderance of Evidence Activity Card 5.1.3 Preponderance of Evidence Graphic Organizer Pkia Video, http://www.youtube.com/watch?v=QVJuRgil0wQ or search for dam cute pika	
15 min	A Process of Science - Teacher presents and discusses the process of science, scientific consensus, science in policy, and political interference in science.	PRESENTATION 5.1.4 Process Science SLIDES	
5 min	Video of Commercial on Carbon Dioxide - Teacher plays video without much of an introduction. After viewing the video, the teacher asks for initial impressions.	VIDEO 5.1.5 Video clip for RealPlayer http://www.factcheck.org/article395.html has the video as a download http://www.youtube.com/watch?v=7sGKvDNdJNA&feature=player_embedded	

10 min	Students work in groups to analyze the commercial using the transcript and questions on a task card.	GROUP WORK 5.1.6 Transcript of commercial 5.1.7 Task card for student analysis
Day 2		
3 min	Bellwork: Perhaps you have heard debates about global warming. Write down different arguments that you have heard in the media about global warming.	INDIVIDUAL SEAT WORK
5 min	What are some of the major debates over global warming that you wrote down for bellwork? - Have students share what they have heard and where they have heard it. Write some of these ideas on the board and note the sources. - Tell students that they will be watching segments from a video called "The Global Warming Swindle". On their handout, they will be asked to write down some of the major arguments that the video makes. They can also write notes about what they think about the argument to the side as they will be talking about these in groups after the video.	TEACHER-LED DISCUSSION
20 min	Watch Global Warming Swindle Parts 1 & 2 - Use the note guide to write down the major arguments that the movie makes.	WATCH VIDEO Student Handout 5.2.1: Video Guide Part 1 Link: http://www.youtube.com/watch?v=6TqqWJugXzs Part 2 Link: http://www.youtube.com/watch?v=L5rGpDMN8lw&NR=1
8 min	Teacher-led Discussion - Based on your note guide, what are some of the major arguments that the film makes? - What are their sources of evidence? - What is your response to these claims?	TEACHER-LED DISCUSSION
14 min	Watch the Global Warming Debate Rebuttal	WATCH VIDEO Part 1 Link: http://www.youtube.com/watch?v=lljGynF4qkE&feature=related Part 2 Link (only need to watch first few minutes): http://www.youtube.com/watch?v=goDsc9laSQ8&feature=related

6 min	Class Discussion How did both of the films use evidence? What kind of experts can you trust? What must you think about when viewing media critically about climate change?	TEACHER-LED DISCUSSION
HW	Review Mitigation Strategy Wedges Table	

LP 6

Climate Change Mitigation Plan

# of Days	4		
Prior Knowledge			
Lesson Objective	Students will be able to compare and contrast climate change mitigation strategies (macro and micro) in light of environmental, economic, political, and ethical impact.	Language Goals/Demands	Some expert groups may receive more than 3 wedges or some home groups may have more than one individual from an expert group.
Lesson Assessment (Benchmarks or Standards)	Mitigation Performance Assessment: Group & Individual Products	Changes for Next Time	
Materials Needed	Mitigation Diagram, Wedge Activity Packets including task cards, resource cards, and graphic organizers. Individual assessment prompt		What Worked Well
Time	Learning Task or Activity	Method & Notes	
Day 1			
15 min	Mitigation Wedges Introduction - Define & illustrate mitigation wedges using diagram - Introduce the activity, goals and procedures - in reviewing the first 4 strategies, ask students how that strategy may impact them.	LECTURE Use 6.1.0 to guide the whole activity Use 6.1.2 Slides for Mitigation Stabilization Wedge Activity <i>Optional - 6.1.3 Review the 4 strategies discussed previously</i>	
35 min	Expert Group Jigsaw - Students analyze 3-4 wedge strategies in expert groups to take back to their home groups.	GROUP WORK - Have task cards, resource cards, and graphic organizers ready for groups 6.1.3 Expert Groups Task Card #1 6.1.4 Strategy Wedge Table 6.1.5 Graphic Organizer 6.1.6 Resource Cards	
HW	Students review their organize to present to their home groups tomorrow.		
Day 2			
25 min	Home Group Sharing - Experts divide into their home groups and give an overview from their graphic organizer about their particular wedge.	GROUP WORK - Teachers monitor group progress	

5 min	Final Product Assignment - Discuss the expectations for the final product from each group.	ASSIGNMENT 6.2.1 Student Handout Mitigation Project
25 min	Home Group Discussion - Home groups choose 5 strategies/ wedges based on the given parameters. - Students discuss the rationale of picking specific wedges. - Teachers monitor group progress.	GROUP WORK 6.2.2 Home Group Assignment (Task Card #2) 6.2.3 Mitigation Plan Worksheet
Day 3		
15 min	Home Group Wedges Finalization - Groups label the wedges on their final diagram that will be turned in and check over their group summary sheet. - Groups should turn in a consensus analysis of their plan by the end of the period. -Students create mitigation posters.	GROUP WORK Review 6.2.1 Student Handout Mitigation Project, given out previously Poster making supplies
35 min	Mitigation Plan Analysis - Students are given the graphic organizer to analyze their choices in light of two different perspectives.	GROUP WORK 6.3.1 Mitigation Plan Group Assignment 6.3.2 Mitigation Plan Answers
Day 4		
20 min	Class Discussion of Plans - Examine the posters. - Ask different groups to talk about how one wedge they chose affected one of the perspectives in each of the categories.	TEACHER-LED DISCUSSION
30 min	Individual Assessment - Given a standard mitigation plan, students will analyze the plan's consequences for a new perspective.	SUMMATIVE ASSESSMENT 6.3.3 Individual Assignment Students will need their Mitigation Plan Worksheets (6.2.3)